# Purpose

The purpose of this document is to outline what is involved in the project. It is intended to be an explanatory document, and is rough workings and thoughts mostly.

# Four main separations

According to the Moodle site, there is:

* Project Interfacing
* Project Design
* Project Feasibility
* Project Pitching

That make up 55% of the total unit mark. The “Project” is technically worth 60%, but this includes the quizzes on the temperature sensors.

# Project Interfacing

## Part A (12%)

The project interfacing focuses on the “Raspberry Pi interfacing using Python and the AD sampler rig to:

* Calibrate the load cell to determine the amount of liquid filled into the plastic Erlemeyer flask
  + Questions: How does the load cell work?
  + Do we need to tare?
  + We need to do a conversion factor on it
  + Could do calibration off of gaining lots of points and interpolating.
  + Need to learn more about.
  + Needs to work with an amplifier.
* Calibrate the amount of turning by the rotational platform using the servomotor
  + What does “calibrate the amount of turning” mean? Does this mean we set the amount of turning? Do we just pre-set the amount of turning? Do we need to set and measure the amount of turning?
    - The inputted value that we use (say 100) doesn’t mean 100 degrees or 100 turns. What does a unit input mean as a unit output, what are the unit outputs?
    - The objective is to rotate to get different sides/angle views of the liquid.
    - Angle and also maybe speed?
* Calibrate the IMU for tilting, and acceleration
  + IMU stands for Inertial Measurement unit
  + How does the IMU actually work? How do we calibrate it? Do we need to test in some ways?
    - Conversion for these, depending on the library that is used.
  + How do we actually test acceleration
* Record images using the Pi Camera
  + Need to understand how the Pi camera works, how to record images on it.
  + Do we need to save?
  + How could we pull up and access past documents if needed?
* For the actual video/presentation:
  + Try to have this such that we have continuous outputs. Have a capture of a video, and the live capture of the screen (with the console output)

The “assessment mode” is solely on task fulfilment. However, **the submission for this is actually a 3 minute video in .mp4 format.**

This overall doesn’t seem too bad, but getting the video all sorted out will be a pain. **Dedicate at least 1 week for the video, meaning that this needs to be done by Friday night of Week 5, for video creation to follow.**

## Part B (10%)

This part involves the simulation (What does simulation mean here? Do we make all of these things happen, and that’s sufficient???) of:

* The foaming characteristics of AD using soft drinks.
  + What exactly do we do here? Just make soft drink foam? Do we need to measure this?
  + determine how much foam is generated.
  + Stirring to generate the foam is done on our own.
* The colour change characteristics of AD with time using food dye.
  + So do we just insert food dye in, and then have some sort of way of recording the change in colour? Do we need to have specific ways of doing this?
  + Measure the colour not the colour change.
    - This is through RGB

Investigations of system stability:

* Determine the fastest possible turning speed of the rotational platform when the Erlemeyer flask is full.
  + Is this just a spill thing? What conditions are we limited by here?
  + Probably are actually limited by the rotational speed of the servo.
  + We also define what the “full” level is.
  + Do we implement safety factors?
* Determine the maximum imposed tilt when the Erlemeyer flask is full.
  + Again, is this a spill thing? I’m guessing it’s a spill while rotating? What restrictions do we have to place on this? Come up with ourselves? If so the tilt should come first, followed by the max rotational speed.
  + About safety of any spills, and also reading of the foam
  + Do we implement safety factors?
* Determine the maximum imposed acceleration when the Erlemeyer flask is full.
  + Again, is this a spill thing? I’m guessing we use the IMU to measure the acceleration?
  + Do we implement safety factors?
  + The amount of acceleration for any spillage.
  + What does imposed mean here? Also need Tuck to clarify what he wants to see.
* Can do operating/non-operating tilts too.
* This is intentionally meant to be vague.

Improvement of system performance using (credit will be awarded for minimal usage of external electronic components):

* Electrical energy saving measures
  + Probably only turning things on when needed
  + PWM on some of the other things?
* Controlled lighting for imaging
  + What does this mean? As in we have some lighting that we put in? I’m confused about what they mean here.

Describe and justify approaches, and include graph illustrations for results.

Submission: One short video in .mp4 format (not exceeding 3 minutes) illustrating the work done. A demonstrator must also be notified before the submission is made.

Assessment mode: 50% task fulfilment, **50% on comparative team performance**

## Part C (8%)

Creating an enhanced human-machine interface using:

* Remote WiFi control of kit functions using a smartphone (preferred) or PC/laptop
  + How will we do this?
* Interactive touchscreen (preferred) or mouse operation of kit functions
  + Is this just the same as the above? Providing a UI for this to run on?
* “Enhanced” UI, so we should try to go a bit above and a bit extra.

Assessment Mode: Comparative team performance.

# Project Design

This, at least to me, seems like something we could immediately have team members who are more confident and comfortable with CAD, and not as much with electricals/software, to work on. There’s no real need to delay a start.

## Part A: Product Design (12%)

On moodle they provide us with a Product Design criteria. It has some mandatory and other characteristics.

* This has human intervention to get the sample into the instrument.
* The instrument is supposed to be a handheld instrument for testing.

Submission for assessment include

* Drawing of the assembled device in .bmp format (as a single A4 size image).
* Detailed part and assembly CAD drawings in .dwg format (in a single zip file).
* Supplementary information to be included with the drawings are (in a single word file):
  + A parts list, where for each item the quantity, part number, description, notes/remarks is indicated;
  + A purchase parts list, where for each item the quantity, part number, supply vendor, part/model reference, cost, notes/remarks is indicated.
  + Justifications of how the mandatory specifications and the desirable characteristics of the system are met.

Assessment Mode: **50% on specification fulfilment and 50% on comparative team performance.**

## Part B: System Performance Justification (3%)

This is the description of efforts expended to support design features. Comparatively, this is worth a lot less than the Part A of the project.

It is a single word doc, with the:

* Calculations
* Simulations
* Physical experiments
* in a 3000 word, 10 figure document.

What to focus on:

* Expected shocks that could be felt (if it fell off of a table, what is the expected force and the expected impulse when it hits the ground? Will this break it?)
* Does the unit actually hold against the force?
  + Glass could break?
  + Outer plastic shell could break?
  + Calculations/simulations for this
* WIll the plastic chassis be okay with the torque from twisting when screwing in to the tap.

**Assessment mode is solely on comparative team performance.**

# Feasibility (5% Week 10)

This is supposed to be presented as an informative document to potential investor to fund the development of working prototypes. It must feature the **report** in a word format, and the **Bill of materials** in an xlsx format. For some more information, it should include:

* Framing: the framing for this is that we are getting capital from someone, we will design, test, produce the product and sell branded as our own into the market.
* Pictorial illustrations of the team’s design
* This is meant to be a convincing funding proposal in some ways. Does it work, will it work...?
* The document must not exceed 9 A4 pages (excluding cover page) in length.
* All text must use the Times Roman 12 pt font & paragraphs must apply 1.5 line spacing throughout.
* An introduction section providing some background of the design must be included
* A conclusion section providing summary of main points of the design and costing information must be included
* All figures must be indexed and captioned
* Credit will be given to how well the document is organized, how engaging it is, and how readable it is
* Costing approximations are allowed but credit will be given to costs that are obtained from verified sources (explanation or evidence of every instance to be listed in the Comments worksheet of the spreadsheet)

Assessment Mode: 60% on task fulfilment and 40% on comparative team performance.

# Project Pitching (5% Week 10)

An .mp4 video file explaining the design and why it should be supported for commercial realisation.

Requirements:

* Not exceeding 10 minutes in length
* All team members are expected to be featured in the video
* All team members are to be identified in the video
* Credit will be given to the level of engagement and how compelling the pitch is

Assessment Mode: 25% on task fulfilment and 75% on comparative team performance.